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whatever, and I gave that form to the ball which satisfied my eye best on a comparison with the telescopic image. I have during my sojourn here made several sets of measures of the equatoreal and polar diameter, and the result is that $e = 0{\cdot}078764$ or $\frac{1}{12{\cdot}697}$ this compression (*apparent* compression — no correction being applied for present inclination of the axis) does not differ greatly from your own measures given in p. 21 of the *Notice*. Curiosity has led me to refer to my copy of the drawing sent last to the Society, and I find the compression is there graphically given *less* than the measurements show, viz. $0{\cdot}05485$, or $\frac{1}{18{\cdot}23}$ so that the drawing does not differ *so much* from the circle as either your own or my measures warrant.

"I presume that the 'something' which you thought you had discovered, but did not reveal in your note of the 20th November, is some inclination of the obscure ring to the plane of the others, evinced by an apparent encroachment of the dark ring on the bright one, and a want of symmetry in its elliptic projection. I can only remark upon this, that I have not observed such appearances; and whether I might have been able in any degree to confirm your observation, if my attention had been especially directed to that point, I cannot now say. The weather has been lately unfavourable, even here, and *Saturn* is getting fast away now into the twilight.

"*Valetta, Feb.* 7, 1853."

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## *Letter from the Rev. W. R. Dawes to Mr. De La Rue.*

"Since I met you at the January meeting of the Astronomical Society, I have been looking over some observations of the diameters of *Saturn*, which I obtained in 1848. They are but few — only two sets of each diameter; but the measures were taken under remarkably favourable circumstances. In my journal, I have noted that the planet was *exquisitely* defined, and all the measures excellent. As they were so few, and it was probable that the larger telescopes in some of the public and private observatories would be specially directed to the subject, I made no use of them, and was not aware of the ellipticity they indicated. On reducing them and calculating the result, I find from one of the sets, $e = \frac{1}{12{\cdot}163}$, and from the other, $e = \frac{1}{11{\cdot}813}$; the mean being $e = \frac{1}{11{\cdot}988}$, which is somewhat larger than I should have expected from my impression of the appearance of the planet at that time. Yet on drawing an ellipse of these proportions, it does not appear preposterous, as you will perceive in the diagram inclosed, along with one representing the ellipticity according to Mr. Main's observations. With respect to these, the Astronomer Royal has informed me that, at the time, such an ellipse was deemed *satis-*

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*factory to the eye* when compared with the planet as seen in the telescope; so that I must withdraw my too hasty remark on that point, in a recent letter to yourself, which I perceive is inserted in the number of the *Monthly Notices* for November 1852. If I had had the opportunity of revising it, I should probably have modified the substance of the remark, and certainly the manner of it.*

"In the *Monthly Notices*, vol. x. p. 7, are some measures of the diameters of *Saturn* (10 of each) by the Rev. R. A. Thompson, with the Durham Fraunhofer equatoreal, which give $e = \frac{1}{11\cdot233}$. I remember being struck with the extraordinary compression shown in the diagrams of *Saturn* by Julius Schmidt, of the Bonn Observatory, contained in No. 650 of the *Astronomische Nachrichten.* On turning to them, I find they are evidently drawn to a scale, representing, probably, the results of observations; but *what* observations I do not know, as none are mentioned, I believe, in Schmidt's paper. The proportions of the diagrams give $e = \frac{1}{9\cdot667}$. It is to be regretted that the ellipticity assumed in the *Nautical Almanac* is not stated in the preface. Computed from the data for 1853, Sept. 1, it seems to be $e = \frac{1}{13\cdot035}$; but I am not aware from what observations this is deduced: and the result can be only approximate.

"*Wateringbury, Feb.* 12, 1853."

Sir William Herschel determined the ellipticity of *Saturn* to be $\frac{1}{10\cdot368}$ (*Phil. Trans.* 1806, p. 461), Bessel found it to be $\frac{1}{10\cdot199}$ (*Ast. Nach.* No. 275, p. 170). The following is a synoptic view of the different results:—

| | | | |
|---|---|---|---|
| Main .......... | 0·10838 | = | $\frac{1}{9\cdot227}$ |
| Johnson ........ | 0·09940 | = | $\frac{1}{10\cdot060}$ |
| Bessel ........ | 0·09805 | = | $\frac{1}{10\cdot199}$ |
| Herschel I. .... | 0·09630 | = | $\frac{1}{10\cdot384}$ |
| Thompson ...... | 0·08902 | = | $\frac{1}{11\cdot233}$ |
| Dawes ........ | 0·08341 | = | $\frac{1}{11\cdot988}$ |
| De la Rue ...... | 0·08139 | = | $\frac{1}{12\cdot29}$ |
| Lassell ........ | 0·07876 | = | $\frac{1}{12\cdot697}$ |

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* The letter from Mr. Dawes to Mr. De la Rue was a *private* one, and should have been referred to the writer *before printing*, but was not, either from hurry or inadvertence.—R. SHEEPSHANKS.

It is to be borne in mind that only the first, third, and fourth of these results have reference to the *true* ellipticity of the planet. All the others represent merely the *apparent* ellipticity, as cited in the above letters of Messrs. Lassell and Dawes, and in a letter of Mr. Dawes, inserted in the *Notice* for November.

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To obviate the flexure which is found to be so serious an objection in large reflectors, Lieut. Hardy proposes to cast the speculum with three or more bosses at the back, the bosses are to be fixed to a stout disc of cast-iron. It is thus expected that the flexure or distortion of the speculum while polishing or in use, may be resisted by the strength of the iron, which serves also for fixing and adjusting the speculum in its tube.

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In compliance with a suggestion of the President, W. R. Grove, Esq., F.R.S., made a verbal communication of some means he had lately employed with success in improving ordinary refracting telescopes.

It is known, that in the object-glasses of these instruments the chromatic aberration is, as it is termed, over-corrected, while, practically, the spherical aberration is imperfectly or under-corrected. Mr. Grove had tried many expedients to remedy or abate these defects by some simple plan applicable to existing instruments.

If the glasses be separated a slight distance, as recommended by Sir J. Herschel, the chromatic aberration may be corrected, but the spherical aberration is generally increased to such an extent as to greatly deteriorate the performance of the instrument. In some cases where the inner curves of the flint and crown glasses approximate, Mr. Grove had employed with success a highly-refracting cement, made of very clear rosin and castor-oil, which, acting as a third lens or convex meniscus of a medium dispersing the coloured spaces differently from the other two lenses, corrected to a very great degree the chromatic without increasing the spherical aberration. This compound forms an excellent tough cement; it is nearly, and may be made absolutely, colourless, and might possibly be used in small telescopes instead of a flint-glass.

With telescopes in which the curves would not admit of a cement he had tried lenses of plate-glass, placed at opposite distances between the object and eye-glasses of the telescope; this plan he conceived was applicable to by far the greater number of common telescopes, and much improved their performance. It differs from the plans of Littrow, Rogers, or Barlow, in consisting of a *convex* lens, and in being applicable, at a very trifling expense, to telescopes constructed in the ordinary way. Mr. Grove had tried various curvatures and distances of this interposed lens, but as his experiments were made for amusement, and with no notion of publication, he had not noted the details. The following was the best result he had obtained :—

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In a 5-foot 4-inch telescope, having a clear aperture of 3·6 inches, a small plane convex lens of plate-glass, of 6-feet focus, was placed, at a distance of one foot from the eye-glass, with the plane side towards the eye; the diameter of this lens need not be more than an inch, and it can generally be attached with ease to the inner extremity of the sliding eye-tube. This had produced so beneficial a result that a mediocre instrument had been changed into a very good one,—showing, for instance, the inner ring of *Saturn*, defining beautifully the division in the main ring, and dividing double stars well up to a second of space.

The effect of such a lens is three-fold. 1st, It brings back the over-correction of the object-glass; 2dly, being of a glass acting somewhat differently on the coloured spaces, it causes them to overlap, and gives a greater residuum of white light; and, 3dly, upon the principle of the Huyghenian eye-piece, it lessens the spherical aberration by receiving the more refrangible at a less oblique incidence than the less refrangible rays.

It will be obvious, that the nearer the interposed lens is to the object-glass the less should its curvature be, but in proportion as the object-glass is approached the difficulty of centering and defects in curvature become more felt; if, again, the interposed lens be brought very near the eye-glass, less effect upon the aberrations is produced.

Practically, lenses having foci somewhat greater than the object-glass, and placed at a distance from the eye-glass of from one-fourth to one-fifth of the focal length of the object-glass, will be found to answer; and the effect being one of degree, no mathematical accuracy in the amount of curvature is required.

## WESTPHAL'S COMET (II. 1852).

This comet has finally disappeared from the observations astronomers. It was first discovered by Dr. Westphal, at Göttingen, on the 24th of July, 1852 (*Ast. Nach.* No. 819, p. 43). In all probability, the last observation of it was one which was made by Sig. Secchi, at Rome, on the 30th December following. A great number of observations of this interesting object will be found in Nos. 820–847 of the *Astronomische Nachrichten.* Elliptic elements have been calculated by Sonntag, which assign to it a period of 60·8 years (*Ast. Nach.* No. 836, p. 321). M. Marth, of the Königsberg Observatory, from observations separated by a wider interval, has deduced elements indicative of a period of 58·35 years (*Ast. Nach.* No. 839, p. 379). A more accurate set of elements will doubtless be obtained by a discussion of the totality of the observations. Some remarks on the physical appearance of the comet by M. Reslhuber of Kremsmünster, and M. Fearnley of Christiania, will be found in Nos. 846–7 of the *Astronomische Nachrichten.* The former of these observers, in a note relative to its appearance on the 26th of August, states that the tail had *a decided*